

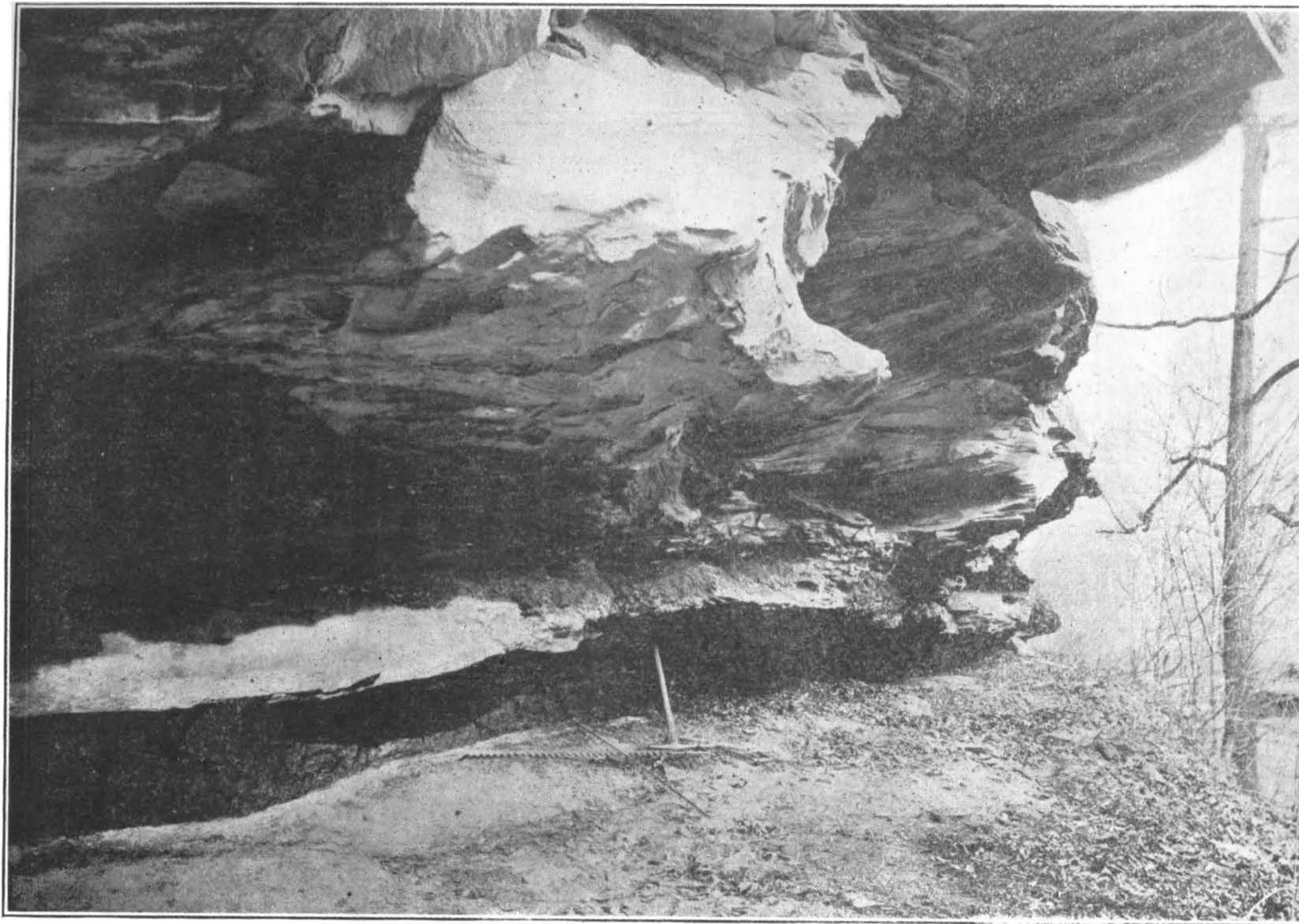
*The*  
*Kentucky Geological*  
*Survey*

WILLARD ROUSE JILLSON  
DIRECTOR AND STATE GEOLOGIST



SERIES SIX  
VOLUME SIX

*The Sixth*  
*Geological Survey*  
*1921*



**THE WHITESBURG COAL AND SANDSTONE "ROCKHOUSE" ROOF.**

This characteristic view of the well known Whitesburg coal and its superimposed thirty feet of cliff forming sandstone may be seen on Otter Creek just above its juncture with the Middle Fork of the Kentucky River in Perry County.

# THE SIXTH GEOLOGICAL SURVEY

An Administrative Report of the Several Mineral Resource  
and General Geological Investigations Under-  
taken and Completed in Kentucky  
during the Biennial Period  
1920-1921



By  
**WILLARD ROUSE JILLSON**  
DIRECTOR AND STATE GEOLOGIST

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PRESENTED WITH TEN SEPARATE  
MISCELLANEOUS GEOLOGICAL PAPERS

BY  
GEORGE P. MERRILL,  
STUART WELCHER  
WILLARD ROUSE JILLSON  
STUART ST. CLAIR  
AND  
CHARLES STEVENS CROUSE

*Illustrated with 101 Photographs  
Maps and Diagrams*

***First Edition***

1,000 Copies

THE KENTUCKY GEOLOGICAL SURVEY  
FRANKFORT, KY.  
1921



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## PREFACE

Applied geology is of great economic value to every State in which natural resources are only partly developed. This is especially true of Kentucky where the great body of mineral resources are now less than 20% under commercial operation. An ideal arrangement would be one where the State would have completed the base (topographic) mapping and the preliminary geological-resource surveys prior to the opening up of any oil, coal, natural gas, asphalt or other field. During the period of proving up such a field, State employed geologists could well work hand in hand with the operators, and assist them greatly in their efforts to win the resources desired.

Unfortunately this ideal arrangement has never existed in Kentucky, though it has to some extent in other States. With only 46% of Kentucky base (topographic) mapped, and with an area approximating that of sixty counties not covered by any accurate maps at all, the function of the Kentucky Geological Survey has always been crippled and held in restraint. The day of a 100% efficiency of the Kentucky Geological Survey seems yet to be in the distant future.

During the last biennium a large number of subjects of great economic value to this State have been investigated, however, by the Kentucky Geological Survey. A full account of these investigations is presented herewith in the first paper of this volume entitled, "The Sixth Geological Survey." A number of these economic papers are included within the covers of this book, and should assist materially in an understanding of the geology and resources of the several regions covered. This report is issued in an original edition of one thousand copies.



Director and State Geologist.

Old Capitol,  
Frankfort, Kentucky.  
December 15, 1921.

# CONTENTS

	Page
Preface .....	v
Contents .....	vi
Illustrations .....	vii
I. The Sixth Kentucky Geological Survey (Administrative Report, 1920-1921), by Willard Rouse Jillson .....	1
II. The Cumberland Falls, Whitley County, Ky., Meteorite, by George P. Merrill .....	35
III. Geology and Coals of the Middle Fork of the Kentucky River near Buckhorn in Perry and Breathitt Counties, Ky., by Willard Rouse Jillson .....	53
IV. Oil Pools of Warren County, Ky., by Stuart St. Clair .....	103
V. A New Method of Producing Crude Oil in Kentucky, by Willard Rouse Jillson .....	149
VI. Retorting Methods as Applied to Kentucky Oil Shales, by C. S. Crouse .....	155
VII. Oil and Gas Possibilities of the Jackson Purchase Region, by Willard Rouse Jillson .....	191
VIII. Oil and Gas Possibilities in Caldwell County, Ky., by Stuart Weller .....	221
IX. Drainage Problems in Kentucky, by Willard Rouse Jillson .....	233
X. Recent Mineral Production in Kentucky, by Willard Rouse Jillson .....	261
XI. The Region About Frankfort, by Willard Rouse Jillson .....	269

# ILLUSTRATIONS

No.		Page
	Frontispiece: The Whitesburg Coal and Sandstone "Rock-house" Roof.	
1.	Index Map Showing Progress of Topographic Survey, opp.....	12
2.	Type of New Topographic Map .....	12
3.	Microstructure of the Cumberland Falls, Ky., Meteorite.....	36
4.	Microstructure of the Cumberland Falls, Ky., Meteorite.....	37
5.	Microstructure of the Cumberland Falls, Ky., Meteorite.....	38
6.	Microscopic Detail of Meteorite .....	39
7.	Fragment of Cumberland Falls Meteorite .....	41
8.	Detail of Microscopic Structure .....	43
9.	A Meteoritic Individual .....	48
10.	A Study in Meteoritic Structure .....	50
11.	Outline Map of the Buckhorn Region .....	52
12.	Altro, Breathitt County, Ky. ....	53
13.	Outline Map of the Buckhorn Region .....	54
14.	Panorama of Buckhorn, Ky. ....	55
15.	Long's Creek After a Hard Rain .....	56
16.	The Mouth of Otter Creek .....	57
17.	A Comfortable Mountain Home .....	58
18.	Bowling Creek, Breathitt County, Ky. ....	59
19.	Crockettsville, Breathitt County, Ky. ....	62
20.	Hazard Coal at the Mouth of Otter Creek .....	64
21.	The Fire Clay Rider—38 inches Solid Coal .....	65
22.	A New Opening of the Hazard Coal .....	66
23.	The Whitesburg Coal at Buckhorn .....	70
24.	Face of the Whitesburg Seam .....	71
25.	Coal Prospect on Johnson's Fork of Long's Creek.....	72
26.	The Hazard Coal—57 inches .....	73
27.	The Fire Clay Rider on Bush Branch .....	75
28.	Domestic Opening on Bowling Creek .....	77
29.	Whitesburg Coal on Squabble Creek .....	78
30.	Fire Clay Rider Coal on Cam Johnson Branch .....	79
31.	Coal Sections, Breathitt and Perry Counties, Ky. ....	83
32.	Coal Sections, Breathitt and Perry Counties, Ky. ....	85
33.	Coal Sections, Breathitt and Perry Counties, Ky. ....	88
34.	Coal Sections, Breathitt and Perry Counties, Ky. ....	91
35.	Log Transportation on Long's Creek .....	94
36.	Bush Branch, Breathitt County, Ky. ....	95
37.	Victor and Vanquished .....	96
38.	A Kentucky River Ford .....	98
39.	Outline Map of Warren County .....	102
40.	College Heights Panorama .....	103
41.	Barren River Topography .....	104
42.	A Barren River Panorama .....	105

	Page
43. A Good Shallow Well .....	106
44. A Drillers' and Tooldressers' Camp .....	108
45. Oil Development in Bowling Green .....	109
46. Shooting Moyer No. 1 .....	111
47. Johnson No. 1 Shot .....	113
48. The Occasional Standard Rig .....	115
49. Type of Portable Rig .....	117
50. On the McGinnis Lease .....	118
51. A Davenport Pool Well .....	121
52. The Spectacular Tarrants Lease .....	123
53. First Well in Davenport Pool .....	126
54. Stockade Enclosing "Oil Mine" .....	148
55. The Kinney "Oil Mine" Shaft .....	150
56. Detail of the Onondaga Limestone .....	151
57. A Laboratory Unit Retort .....	157
58. Diagramatic Sketch of a Pumpherston Retort .....	161
59. Side View Laboratory Model .....	164
60. Gas Discharge and Condenser .....	166
61. The Mississippi River from Hickman .....	190
62. Geologic Map of the Purchase Region .....	191
63. Mouth of the Ohio River .....	192
64. Region of Old Gulf Embayment .....	194
65. Hillman Ferry Over the Tennessee River .....	196
66. Quaternary Gravels of the Purchase Region .....	198
67. A Rustic Home in Marshall County .....	199
68. Panorama in Hickman County .....	201
69. A Marshall County Panorama .....	206
70. The Fulton Well .....	208
71. Lower Reaches of Mayfield Creek .....	219
72. Diagramatic Section Showing Structure of the Farmersville Dome .....	223
73. Structure Map of Farmersville Dome, Caldwell County, Ky.....	226
74. Drained and Undrained Lands .....	234
75. A Former Swamp Cultivated .....	235
76. The North Ditch .....	236
77. Ditch Digging in a Swamp .....	238
78. Map of the South Park Region .....	240
79. Pile Driver at Work .....	241
80. A "Jack at All Jobs" .....	242
81. The South Ditch .....	243
82. A Sewer Digger .....	245
83. Drained Land—Caperton Ranch .....	247
84. Cleaning Out an Old Ditch .....	249
85. A Modern Ditch-Digger .....	250



# ILLUSTRATIONS

ix

	Page
86. Gravels Near Sedalia .....	251
87. Rapid Erosion Checked .....	252
88. What Sweet Clover Did .....	253
89. An Excavating Crane in Detail .....	255
90. Reclaimed Land in Jefferson County .....	256
91. A Kentucky Hillside of No Value .....	257
92. An Inexcusable But Common Condition .....	258
93. The Beautiful Kentucky River .....	269
94. Wooded Hills and Limestone Cliffs .....	271
95. River Industries at Frankfort .....	272
96. A Peep Out Through the Willows .....	274
97. Federal Dam at Lock No. 4. ....	276
98. The Great Ordovician Outlier, "Fort Hill," .....	<b>278</b>
99. Panorama of Frankfort Topography .....	280
100. The Abandoned Thorn Hill Meander .....	281
101. Topography of Frankfort and Vicinity, opp. ....	282

THE SIXTH  
GEOLOGICAL SURVEY

# X

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## RECENT MINERAL PRODUCTION IN KENTUCKY

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BY WILLARD ROUSE JILLSON.

*Director and State Geologist.*

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### THE KENTUCKY GEOLOGICAL SURVEY.

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The State of Kentucky is one of the richest mineral resource storehouses of the Appalachian region. Within its area of 40,598 square miles there are found in commercial and in smaller quantities in the crude or natural state about 30 separate minerals from which a great number of mineral products may be manufactured or refined. The list of minerals and direct mineral products of Kentucky is as follows: (1) Abrasives; (2) Aragonite (Ky. Onyx); (3) Artificial Gas; (4) Asphalt Rock; (5) Barite; (6) Calcite; (7) Carbon Black; (8) Cement; (9) Clay Products (Pottery, Tile, Brick, etc.); (10) Coal (Bituminous and Cannel); (11) Coke (Beehive and By-product); (12) Copper; (13) Fluorspar; (14) Gravel; (15) Gypsum; (16) Iron; (17) Lead; (18) Lime; (19) Marble; (20) Mica; (21) Mineral Fertilizer; (22) Mineral Waters; (23) Natural Gas; (24) Ochre; (25) Oil Shale; (26) Petroleum; (27) Phosphate Rock; (28) Potash; (29) Salt; (30) Sand; (31) Silver; (32) Stone; and (33) Zinc.

Of these several minerals Copper, Gypsum, Mica and Potash occur in such a small quantity, or so rarely, as to be of no commercial importance, and therefore are of scientific interest only. A number of Kentucky's minerals, though occurring in large amounts, are not operated except in a very small way; hence the production is of little or no consequence, and will not be considered here. Included in this list are Abrasives, Aragonite (Ky. Onyx), Calcite, Iron, Marble, Ochre, Oil Shale and Salt. Of these, there is an opportunity now to develop on a much

larger scale and at a profit, Abrasives, Aragonite, Calcite, Marble and Building Stones. Kentucky iron ores, while occurring in large quantity and widely distributed, are very low grade and cannot now compete successfully with the Mesabi and Birmingham ores. Some newly discovered hematites in McCreary County may prove the exception to this rule. Kentucky (Devonian) oil shale is one of the largest and richest mineral resources of the State, though at the present low price of crude oil, and the infancy of the shale industry, the immediate development of this resource is not apprehended. The salt resources of Kentucky are not large, and rock salt in commercial quantities is unknown, but it is certain that in certain districts, notably Leitchfield, good semi-artesian brines in very large quantity may be secured.

The following minerals are operated in commercial quantity, and their production coupled with agriculture affords the principal revenue of this State. This list includes Artificial Gas, Asphalt Rock, Barite, Carbon Black, Cement, Clay (and Shale), Coal, Coke, Fluorspar, Lead, Lime, Mineral Waters, Natural Gas, Natural Gas Gasoline, Petroleum, Phosphate Rock, Sand and Gravel, Stone, Tar, and Zinc.

The three minerals having the largest production and value in the State of Kentucky for the years 1918-1920 are in order, coal, petroleum, and fluorspar. As a national producer, Kentucky was, in 1920, fifth in the production of coal, eighth in oil, and second in fluorspar in the whole United States. The production figures of these minerals with their totals is given below. These minerals aggregate in value for this short period of 3 years a total of \$401,251,701.

TABLE I.				
PRODUCTION OF COAL, PETROLEUM, AND FLUORSPAR IN KENTUCKY, 1918, 1919, 1920.				
Coal	Production—Tons	Value	Total Number of Tons	Total Value
1918 .....	31,530,442	\$94,591,326		
1919 .....	30,036,061	73,891,049		
1920 .....	38,892,044	159,457,380	100,458,547	\$327,939,755
Petroleum	Production—Bbls.	Value		
1918.....	4,306,893	\$11,128,421		
1919.....	9,226,473	24,459,017		
1920.....	8,546,027	33,525,210		\$69,112,648
22,079,393 bbls.				
Fluorspar	Production—Tons	Value		
1918.....	87,604	\$2,069,185		
1919.....	32,386	883,171		
1920.....	46,091	1,246,942	166,081	\$4,199,298
Grand Totals .....			100,624,628	\$401,251,701

The real importance and size of the coal, petroleum, and fluor-spar industries in the State of Kentucky as compared to those of all other mineral industries of this State may be seen in the following table, where total values are contrasted.

The statement showing the entire mineral production of Ken-tucky for the three years, 1918, 1919 and 1920, insofar as it has been possible to complete it, is given herewith.

TABLE III.

1.	Artificial Gas	Production—M. Cu. Ft.	Value	Average Price
	1918	..... 4,279,853	\$202,914.00	\$0.05*
	1919	.....		
	1920	.....		
2.	Asphalt Rock	Production—Tons	Value	Average Price
	1918	..... 3,194	\$30,343.00	\$9.50
	1919	..... 32,050	304,475.00	9.50
	1920	..... 58,507	555,816.50	9.50
3.	Barytes	Production—Short Tons	Value	Average Price
	1918	.....		\$4.90 (?)
	1919	..... 5,435	\$36,408.00	6.70
	1920	.....		
4.	Carbon Black (Natural Gas)	Production—Lbs.	Value	Average Price
	1918	..... 1,600,000	\$256,000.00	\$0.16**
	1919	..... 2,922,274	244,726.00	0.08-3/10
	1920	..... 1,468,182***	308,318.22	0.21
5.	Cement	Production—Bbls.	Value	Average Price
	1918	..... 536,491	\$698,385.60	\$1.60
	1919	..... 630,000	1,077,300.00	1.71
	1920	.....		
6.	Clay Products	Production—Brick, Tile, Pottery, Fire Clay	Value	Average Price
	1918	.....	\$6,172,554.00	
	1919	.....		
	1920	.....		
7.	Coal	Production—Tons	Value	Average Price
	1918	..... 31,530,442	\$94,591,326.00	\$3.00
	1919	..... 30,036,061	73,891,049.00	2.46
	1920	..... 38,892,044	159,457,380.00	4.12
8.	Coke (Beehive & By-product)	Production—Short Tons	Value	Average Price
	1918	..... 818,785	\$4,455,995.00	\$5.44 +
	1919	.....		
	1920	.....		
9.	Fluorspar	Production—Tons	Value	Average Price
	1918	..... 87,604	\$2,069,185.00	\$23.62
	1919	..... 32,386	883,171.00	27.27
	1920	..... 46,091	1,246,942.00	27.05

\*Per M. cu. ft.

\*\*Per pound.

\*\*\*Production estimated.

10.	Lead	Production—Short Tons	Value	Average Price
	1918	185	\$26,270.00	\$0.077
	1919	86	9,976.00	.058*
	1920	122	20,008.00	.082*
11.	Lime	Production—Tons	Value	Average Price
	1918	1,884	\$16,258.92	08.63
	1919	988	9,275.00	9.38
	1920	1,757	18,063.00	10.28
12.	Mineral Waters	Production—Gals.	Value	Average Price
	1918	255,852	\$41,997.00	\$0.16
	1919	213,436	37,876.00	.17
	1920	256,959	39,600.00	.15
13.	Natural Gas	Production—M. Cu. Ft.	Value	Average Price
	1918	3,022,439	\$334,583.99	\$0.1107**
	1919	3,942,000	390,258.00	.099
	1920	3,497,000	354,595.80	.1014
14.	Natural Gas Gasoline	Production—Gals.	Value	Average Price
	1918	3,330,986	\$660,108.00	\$0.198
	1919	5,136,326	1,144,746.00	.223
	1920			
15.	Petroleum	Production—Bbls.	Value	Average Price
	1918	4,306,893	\$11,128,421.00	\$2.58
	1919	9,226,473	24,459,017.00	2.65
	1920	8,546,027	33,525,210.00	3.92
16.	Phosphate*** Rock	Production—Long Tons	Value	Average Price
	1918			
	1919			
	1920			
17.	Sand & Gravel	Production—Tons	Value	Average Price
	1918	818,471	\$557,548.00	\$0.68 +
	1919	1,151,297	744,073.00	.646
	1920	1,637,618	1,047,770.00	.64 +
18.	Stone	Production—Short Tons	Value	Average Price
	1918	988,875	\$970,494.00	\$0.98 +
	1919	1,215,330	1,447,352.00	.653
	1920			
19.	Tar	Production—Gals.	Value	Average Price
	1918	124,628	\$5,995.00	\$0.048
	1919			
	1920			

\*Per pound.

\*\*Per M. cu. ft.

\*\*\*Data could not be secured.

20. Zinc	Production—Short Tons	Value	Average Price
1918 .....	315	\$57,330.00	\$0.08*
1919 .....	36	5,040.00	.07
1920 .....			

While the value of the total mineral production in Kentucky at the present is probably somewhat in excess of \$200,000,000 per annum as shown herein, this amount represents only about one-fifth of the amount of mineral development that this State is capable of sustaining. The exploitation of the mineral resources of Kentucky is much behind that of the adjoining States which have mineral resources of a similar value. Lack of good base maps has held back mineral development in Kentucky.

\*Per pound.

PERCENTAGE OF COMMERCIAL DEPOSITS OF KENTUCKY  
MINERALS NOW DEVELOPED.\*

Crude Minerals and Crude Mineral Products	Estimated Percentage of Deposits Now Being Operated**
1. Abrasives .....	5%
2. Aragonite .....	5%
3. Artificial gas .....	10%
4. Asphalt Rock .....	5%
5. Barite .....	30%
6. Calcite .....	20%
7. Carbon black .....	15%
8. Cement .....	10%
9. Clay products .....	20%
10. Coal (Bituminous and Cannel) .....	35%
11. Coke (Bee-hive & By-products) .....	25%
12. Fluorspar .....	75%
13. Gravel .....	10%
14. Lead .....	15%
15. Lime .....	5%
16. Marble .....	0%
17. Mineral Fertilizers .....	10%
18. Mineral Waters .....	10%
19. Natural Gas .....	25%

\*The low grade iron ore deposits of Kentucky, widely distributed and of immense quantity, are not included in this list, since they are not at the present time able to compete commercially with the Michigan and Alabama ores.

\*\*Exact determination of the percentage of development of the various mineral resources of Kentucky is impossible at present, due to the inadequacy of funds available for this work under State appropriation to the Kentucky Geological Survey.



20.	Ochre .....	2%
21.	Oil Shale .....	0%
22.	Petroleum .....	75%
23.	Phosphate Rock .....	25%
24.	Sand (moulding, building, glass) .....	3%
25.	Stone .....	25%
26.	Zinc .....	10%
		<hr/>
Total .....		470%
Present development of all minerals, general average..		18+

